

NC Purpose of Study

A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

Intent	Implementation	Impact
At Broadway Junior School we believe that a high quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational 'Big Ideas', pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes. Science in our school is about developing children's ideas and ways of working that enable them to make sense of the world in which they live through investigation, as well as using and applying process skills. The staff here ensure that all children are exposed to high quality teaching and learning experiences, which allow children to explore their outdoor environment and locality, thus developing their scientific enquiry and investigative skills. They are immersed in scientific vocabulary, which aids children's knowledge and understanding not only of the topic they are studying, but of the world around them. We intend to provide all children regardless of ethnic origin, gender, class, aptitude or disability, with a broad and balanced science curriculum.	Teachers create a positive attitude to science learning within their classrooms and reinforce an expectation that all children are capable of achieving high standards in science. Our whole school approach to the teaching and learning of science involves the following: Science will be taught in planned and arranged blocks by the class teacher, to have a subject specific approach. This is a strategy to enable the achievement of a greater depth of knowledge. Through our planning, we involve problem solving opportunities that allow children to find out for themselves. Children are encouraged to ask their own questions and be given opportunities to use their scientific skills and research to discover the answers. This curiosity is celebrated within the classroom. Planning involves teachers creating engaging lessons, often involving high-quality resources to aid understanding of conceptual knowledge. Teachers use precise questioning in class to test conceptual knowledge and skills, and assess children regularly to identify those children with gaps in learning, so that all children keep up. Teachers build upon the learning and skill development of the previous years. As the children's knowledge and understanding increases, and they become more proficient in selecting, using scientific equipment, collating and interpreting results, they become increasingly confident in their growing ability to come to conclusions based on real evidence. Working Scientifically skills are embedded into lessons to ensure these skills are being developed throughout the children's school career and new vocabulary and challenging concepts are introduced through direct teaching. This is developed through the years, in-keeping with the topics.	The impact and measure of this is to ensure children not only acquire the appropriate age related knowledge linked to the science curriculum, but also skills which equip them to progress from their starting points, and within their everyday lives. All children will have: - A wider variety of skills linked to both scientific knowledge and understanding, and scientific enquiry/investigative skills - A richer vocabulary which will enable to articulate their understanding of taught concepts - High aspirations, which will see them through to further study, work and a successful adult life.

Key Vocabulary

Material, property, hardness, transparent, translucent, opaque, conductor, insulator, dissolve, soluble, insoluble, solution, mixture, filter, sieve, evaporation, reversible, irreversible, change of state, thermal insulation, temperature, absorbent, fair test, variable.

Knowledge	Skills
Children will know: - Materials have different properties that determine their use. - Some materials dissolve to form solutions. - Mixtures can often be separated using filtering, sieving or evaporation. - Some changes are reversible (e.g. melting, dissolving). - Some changes are irreversible (e.g. burning, rusting). - Thermal insulation reduces heat transfer. - Different materials are more suitable for insulation than others. - Scientists use evidence to decide which materials are best for a purpose.	By the end of the unit, pupils will be able to: - Compare and group materials based on properties. - Carry out fair tests and comparative tests. - Record observations and measurements accurately. - Identify soluble and insoluble materials. - Investigate dissolving and rate of dissolving. - Investigate thermal insulation using layers of materials. - Draw conclusions using scientific evidence. - Explain material choices using scientific vocabulary.

Enrichment Opportunities

- Investigate real-life packaging materials
- Visit a recycling centre or discuss sustainability
- Explore clothing designed for insulation (sportswear, winter gear)
- Cookery link: dissolving sugar, salt, or making solutions
- DT link: designing insulated containers
- Outdoor investigation of thermal materials (school environment)

Learning Objectives/End Points

Pupils will be able to:

- Compare and classify materials by properties
- Explain dissolving and identify soluble substances
- Separate mixtures using scientific methods
- Explain reversible and irreversible changes
- Investigate insulation using fair testing
- Use evidence to justify material choices

Key Questions/Learning Objectives/End Points

To compare and group materials by properties. Sort objects by hardness, transparency, conductivity and magnetism.	To investigate dissolving. Explore different substances in water and observe which dissolve.	To investigate dissolving as a scientific process. Dissolving Investigation (TAPS): test rate of dissolving and record results.	To investigate mixtures and reversible changes. Separate mixtures using filtering, sieving and evaporation.	To investigate thermal insulation. Insulation Layers Investigation (TAPS): test different materials keeping water warm.	To apply knowledge of materials and changes. Design a product (e.g. lunchbox, coat, container) using best materials.
Lesson 1 – Properties of Materials Learning Objective: To compare and group materials by properties. Starter (10 mins) Show a variety of objects. Ask: What are they made of and why? Main (40 mins)	Lesson 2 – Dissolving Learning Objective: To investigate dissolving in water. Starter (10 mins) Ask: What happens when sugar is added to water? Main (40 mins) Test different substances (salt, sugar, sand, flour).	Lesson 3 – TAPS Focused Assessment: Dissolving Learning Objective: To investigate how dissolving can be tested scientifically. Starter (10 mins) Discuss: Does temperature or stirring affect dissolving? Main (40 mins)	Lesson 4 – Mixtures and Reversible Changes Learning Objective: To separate mixtures and identify reversible changes. Starter (10 mins) Show a mixed bowl (rice, pasta, paper clips). Ask: How could we separate this?	Lesson 5 – TAPS Focused Assessment: Insulation Layers Learning Objective: To investigate thermal insulation. Starter (10 mins) Show different materials (foil, fabric, paper, bubble wrap). Ask: Which will keep water warmest? Main (40 mins)	Lesson 6 – Applying Learning Learning Objective: To apply knowledge of materials and their properties. Starter (10 mins) Quick quiz on properties and changes. Main (40 mins) Design challenge:

Teach key properties: hardness, transparency, conductivity, magnetism. Children sort objects into groups based on properties. Discuss multiple possible groupings. Plenary (10 mins) Which property was easiest to use? Why?	Record which dissolve and which do not. Introduce the idea of a solution. Plenary (10 mins) Can all solids dissolve? Why not?	Children design/test a fair investigation into dissolving rate. Variables may include: temperature of water amount of stirring size of substance Record results in tables/graphs. Draw conclusions. Plenary (10 mins) Which factor had the biggest effect on dissolving rate?	Main (40 mins) Practical: filtering, sieving, evaporation. Discuss reversible vs irreversible changes. Plenary (10 mins) Which changes can be reversed? Which cannot?	Wrap cups of warm water in different materials. Measure temperature over time. Record and compare results. Evaluate effectiveness. Plenary (10 mins) Which material was the best insulator? Why	Create a product (lunchbox, coat, bottle, packaging) Choose materials and justify choices scientifically Label with explanations of properties. Plenary (10 mins) Present designs and explain material choices.
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Substantive Knowledge

- Materials have measurable and observable properties.
- Solubility varies between substances.
- Dissolving forms a solution but is often reversible.
- Mixtures can be separated using physical processes.
- Thermal insulation slows heat transfer.
- Some changes produce new materials and are irreversible.
- Scientific testing provides evidence for material selection.

Careers

Linking Curriculum Learning to Careers

Discuss how the skills developed in this unit are used in a range of careers, including:

- Food Scientist
- Food Technologist
- Food Production Technician
- Packaging Technologist
- Laboratory technician
- Chef
- Baker
- Chocolatier
- Recycling Specialist
- Environmental Scientist
- Environmental Engineer
- Sustainability Officer
- Waste Management Officer
- Chemist
- Laboratory Technician
- Scientific Researcher

Transferable skills such as Curiosity Observation Investigation Problem solving Teamwork Communication
Research Organisation Attention to detail Classification Data handling Critical thinking Decision making
Creativity Resilience Responsibility Confidence

Learning from Career and Labour Market Information

- Introduce pupils to careers involving the development, testing, manufacture, recycling and selection of materials, including materials scientists, chemists, engineers, product designers, construction professionals, laboratory technicians and recycling specialists.
Addressing the Needs of Each Pupil
- Provide practical investigations, design challenges, testing, measuring, discussion and research. Highlight that careers use different strengths, including scientific thinking, practical skills, creativity, mathematical reasoning, problem-solving, teamwork and communication.
- **Linking Curriculum Learning to Careers**
Connect material properties to materials scientists and engineers; dissolving and separating mixtures to chemists and laboratory technicians; insulation to building engineers and product designers; and reversible/irreversible changes to chemists, manufacturers and food scientists.
Encounters with Employers and Employees
- Where possible, invite a materials scientist, engineer, chemist, product designer, builder, architect, recycling professional or food scientist to explain how they select and test materials in their work.
Experiences of Workplaces
- Explore laboratories, engineering workshops, manufacturing facilities, recycling centres, construction sites, food production facilities and design studios through visits, photographs or virtual tours.